WHAT IS CLAIMED IS:

1. A method of forming a graded junction in a semiconductor material having a first conductivity type, the method comprising:

introducing dopant having a second conductivity type opposite the first conductivity type into a selected region of the semiconductor material to define a primary dopant region therein, the perimeter of the primary dopant region defining a primary pn junction;

while introducing dopant into the selected region of the semiconductor material, simultaneously introducing dopant into the semiconductor material around the perimeter of the primary dopant region and spaced-apart from the primary pn junction; and

diffusing the dopant in the primary dopant region and the dopant around the perimeter of the primary dopant region to provide a graded dopant region that includes an interior portion that has a first dopant gradient with a first maximum dopant concentration and a perimeter portion that is contiguous with the interior portion and has a second dopant gradient with a second maximum dopant concentration that is less than the first maximum dopant concentration.

2. A method of forming a graded junction in a semiconductor material having a first conductivity type, the method comprising:

forming a patterned mask on an upper surface of the semiconductor material, the mask including a first opening that exposes a first upper surface area of the semiconductor material and a second opening that defines a perimeter upper surface area that surrounds and is spaced-apart from the first upper surface area;

using a single step, utilizing the mask to introduce dopant having a second conductivity type opposite the first conductivity type into the first upper surface area of the semiconductor material to define a primary dopant region therein and into the perimeter upper surface area of the semiconductor material to define a perimeter dopant ring therein that is spaced-apart from the primary dopant region thereby defining a primary junction between the primary dopant region and the semiconductor material; and

diffusing the dopant in the primary dopant region and in the perimeter dopant ring to provide a graded dopant region that includes an interior portion that has a first dopant gradient with a first maximum dopant concentration and a perimeter portion that is

contiguous with the interior portion and has a second dopant gradient with a second maximum dopant concentration that is less than the first maximum dopant concentration, and

wherein the width of the perimeter dopant ring is less than two times (2x) the lateral diffusion length of the primary junction during the diffusing step.

3. A method of forming a graded junction in a semiconductor material having a first conductivity type, the method comprising:

forming a patterned mask on an upper surface of the semiconductor material, the mask including a first opening that exposes a first upper surface area of the semiconductor material and a second set of openings that define a plurality of quadrolateral upper surface island areas disposed around and spaced-apart from the perimeter of the first upper surface area;

using a single step, utilizing the mask to introduce dopant having a second conductivity type opposite the first conductivity type into the first upper surface area of the semiconductor material to define a primary dopant region therein and into the upper surface island areas of the semiconductor material to define a plurality of quadrolateral perimeter dopant islands therein that are spaced-apart from the primary dopant region, thereby defining a primary junction between the primary dopant region and the semiconductor material; and

diffusing the dopant in the primary dopant region and in the perimeter dopant islands to provide a graded dopant region that includes an interior portion that has a first dopant gradient with a first maximum dopant concentration and a perimeter portion that is contiguous with the interior portion and has a second dopant gradient with a second maximum dopant concentration that is less than the first maximum dopant concentration; and

wherein the length and width of the perimeter dopant islands are less than two times (2x) the lateral diffusion length of the primary junction during the diffusion step.